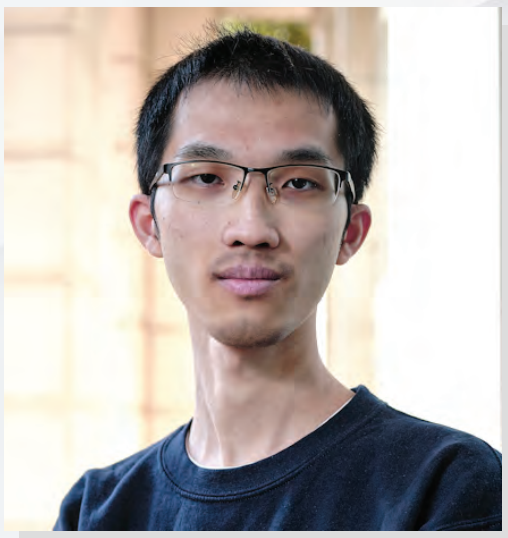
Department of Systems Engineering
香港城市大學
City University of Hong Kong

Bounded Flows in Semialgebraic Optimization



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28 October 2024 (Mon) | 10:00 am

Seminar Link: https://cityu.zoom.us/j/88439421570

Abstract

Modern optimization problems in data science are devoid of many of the classical assumptions, including convexity, smoothness and coercivity. We seek to address this shortcoming by proposing new connections between dynamical systems, algebraic geometry and variational analysis. Our main finding is that several key optimization problems have bounded gradient flows, which serves as an invaluable tool for landscape analysis, gradient dynamics, and first-order methods. For example, it enables us to rule out any spurious local minima at infinity in linear neural networks. It also implies that heavy ball dynamics with friction converges on matrix factorization. On the algorithmic side, it ensures that the proximal random reshuffling converges to stationary points in nonnegative matrix factorization at a rate approaching $o(1/\sqrt{k})$. We will strive for generality in our results by appealing to the class of semialgebraic functions.

About the Speaker

Xiaopeng Li is currently a fifth-year PhD candidate in the Department of Industrial Engineering and Operations Research at Columbia University, under the supervision of Prof. Cédric Josz. His research focuses on solving nonconvex nonsmooth optimization problems with first-order methods and their applications to data science. His work explores the intersection of variational analysis, dynamical systems and real algebraic geometry. Xiaopeng received his Bachelor's degree in Mathematics in 2020 from the Chinese University of Hong Kong, Shenzhen.

Enquiry: 3442 8422 | All are welcome